

**CLAIMS**

Therefore, at least the following is claimed:

1           1.       An apparatus for equalizing a discrete multi-tone (DMT) transmit spectrum,  
2 comprising:

3           a DMT transmitter configured to generate a plurality of DMT carrier tones and  
4 combine the plurality of carrier tones into a transmit symbol;

5           an amplifier configured to detect the transmit symbol;

6           a discrete Fourier transform (DFT) element configured to separate the transmit  
7 symbol into the plurality of carrier tones; and

8           a gain adjustment element configured to adjust each of the plurality of carrier tones  
9 based on a predefined transmit signal spectrum.

1           2.       The apparatus of claim 1, wherein each DMT carrier tone is independently  
2 adjusted.

1           3.       The apparatus of claim 1, wherein the gain adjustment element further  
2 comprises:

3           logic configured to measure the power on each of the plurality of carrier tones; and

4           logic configured to provide a gain scalar for each of the plurality of carrier tones.

1           4.       The apparatus of claim 1, wherein the amplifier monitors local line conditions.

1           5.       The apparatus of claim 1, wherein the transmit symbol is generated prior to a  
2       start-up sequence.

1           6.       The apparatus of claim 1, wherein the transmit symbol is generated after a  
2       start-up sequence.

1           7.       The apparatus of claim 1, wherein each of the plurality of DMT carrier tones  
2       is encoded into a circular signal space constellation.

1           8.       The apparatus of claim 1, wherein each of the plurality of DMT carrier tones  
2       is encoded into a square signal space constellation.

1           9.       A method for equalizing a discrete multi-tone (DMT) transmit spectrum, the  
2       method comprising the steps of:  
3           generating a plurality of DMT carrier tones;  
4           combining the plurality of carrier tones into a transmit symbol;  
5           detecting the transmit symbol;  
6           separating the transmit symbol into the plurality of carrier tones; and  
7           adjusting each of the plurality of carrier tones based on a predefined transmit signal  
8       spectrum.

1           10.     The method of claim 9, wherein the adjusting step further comprises the steps  
2 of:

3           calculating a power level for each of the tones;

4           comparing the power level of each tone with a predetermined power level; and

5           adjusting the power level of each tone to match the predetermined power level.

1           11.     The method of claim 9, wherein the adjusting step is performed using gain  
2 scalars.

1           12.     The method of claim 9, further comprising the step of monitoring a  
2 communication line to detect impedance variations, where the adjusting step is responsive to  
3 the impedance variations.

1           13.     The method of claim 9, further comprising the step of generating the transmit  
2 symbol prior to a start-up sequence.

1           14.     The method of claim 10, further comprising the step of generating the transmit  
2 symbol after a start-up sequence.

1           15.     The method of claim 9, further comprising the step of encoding each of the  
2 plurality of DMT carrier tones into a circular signal space constellation.

1           16.     The method of claim 9, further comprising the step of encoding each of the  
2     plurality of DMT carrier tones into a square signal space constellation.

1           17.     An apparatus for equalizing a discrete multi-tone (DMT) transmit spectrum,  
2     comprising:

3                 means for generating a plurality of DMT carrier tones;

4                 means for combining the plurality of carrier tones into a transmit symbol;

5                 means for detecting the transmit symbol;

6                 means for separating the transmit symbol into the plurality of carrier tones; and

7                 means for adjusting each of the plurality of carrier tones based on a predefined  
8     transmit signal spectrum.

1           18.     The apparatus of claim 17, further comprising:

2                 means for calculating a power level for each of the tones;

3                 means for comparing the power level of each tone with a predetermined power level;

4     and

5                 means for adjusting the power level of each tone to match the predetermined power  
6     level.

1           19.     The apparatus of claim 17, wherein the adjusting means uses gain scalars.

1           20.    The apparatus of claim 17, further comprising means for monitoring a  
2   communication line to detect impedance variations and where the adjusting means is  
3   responsive to the impedance variations.

1           21.    The apparatus of claim 17, further comprising means for generating the  
2   transmit symbol prior to a start-up sequence.

1           22.    The apparatus as defined in claim 17, further comprising means for generating  
2   the transmit symbol after a start-up sequence.

1           23.    The apparatus of claim 17, further comprising means for encoding each of the  
2   plurality of DMT carrier tones into a circular signal space constellation.

1           24.    The apparatus of claim 17, further comprising means for encoding each of the  
2   plurality of DMT carrier tones into a square signal space constellation.

1           25.    An apparatus for equalizing a transmit spectrum of a digital subscriber line  
2   (DSL) communication device, comprising:  
3       means for generating a transmit symbol;  
4       means for detecting the transmit symbol;  
5       means for separating the transmit symbol into a plurality of frequencies; and  
6       means for adjusting a power level associated with each of the plurality of frequencies  
7   based on a predefined transmit signal spectrum.

1           26.    The apparatus of claim 25, wherein the communication device is quadrature  
2   amplitude modulation (QAM) modulated single carrier.

1           27.    The apparatus of claim 25, wherein the communication device is carrierless  
2   amplitude/phase (CAP) modulated single carrier.

1           28.    The apparatus of claim 25, wherein the means for adjusting a power level  
2   associated with each of the plurality of frequencies based on a predefined transmit signal  
3   spectrum further comprises a finite impulse response filter.